X-Ray Fluorescence Studies of Elements in Human Lung Tissue

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X-ray fluorescence (XRF) mapping has been conducted to determine elemental distributions in human lung tissue containing both healthy and cancerous regions. Our ongoing studies compare tissue samples from three people who developed similar types of lung cancer: 1) a Chernobyl clean-up worker, 2) a person who lived in the area of radioactive fallout associated with the Chernobyl disaster, and 3) a person who developed the same type of lung cancer but who was not involved with the disaster. We are investigating whether or not a correlation exists between this cancer and the presence of certain elements. Elemental distributions, particle shape and size, and the correlation between elements are all being investigated. One such result is in Figure 1a). Healthy tissue appears darker in the image, while cancerous tissue appears lighter. The images

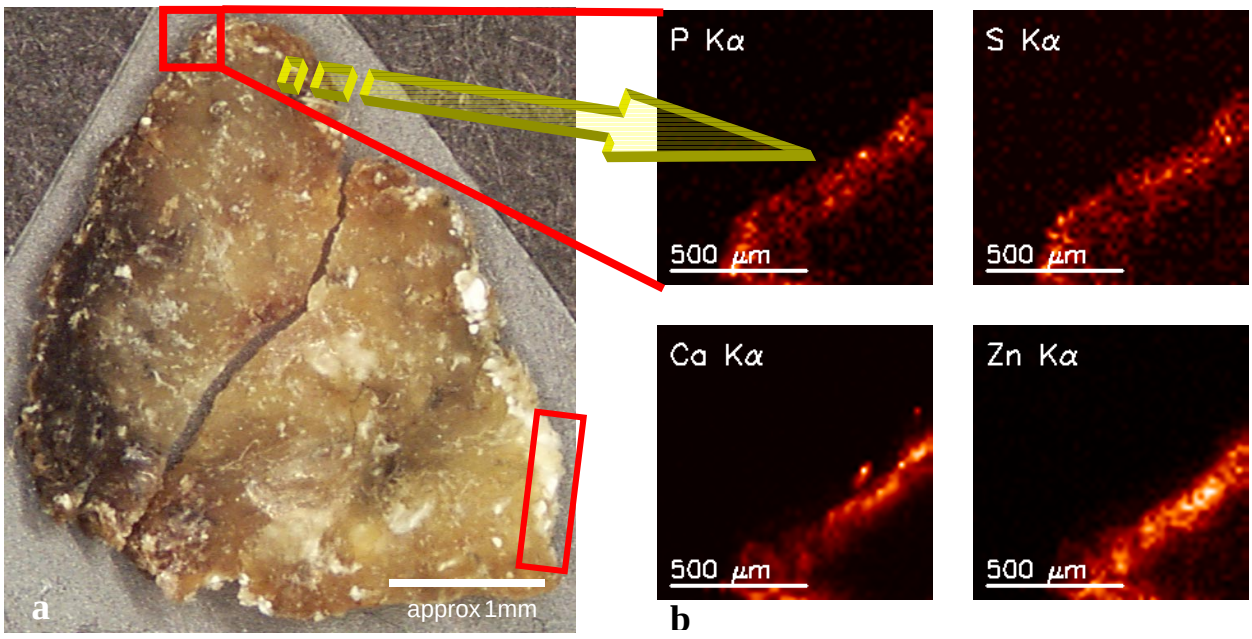

Figure 1. a) Photomicrograph of lung tissue sample from a worker at the radiochemistry factory in Chelyabinsk. b) Elemental distribution maps of P, S, Ca, and Zn.

on the right are elemental maps corresponding to the boxed area in the photomicrograph, showing the relative intensities for P, S, Ca, and Zn. The correlation between the elements is clear, especially between Ca and Zn. Other areas in the sample showed a high correlation between Fe, Ni, Ti, Co, and Mn and seen in the elemental maps in Figure 2. The feature is

believed to be a steel particle approximately 20 μm in size. The feature comes from the boxed region in the lower right of Figure 1a. These particles were seen throughout the sample as well as in other samples. Future experiments will include further mapping of the samples as well as attempts to obtain depth and composition information.

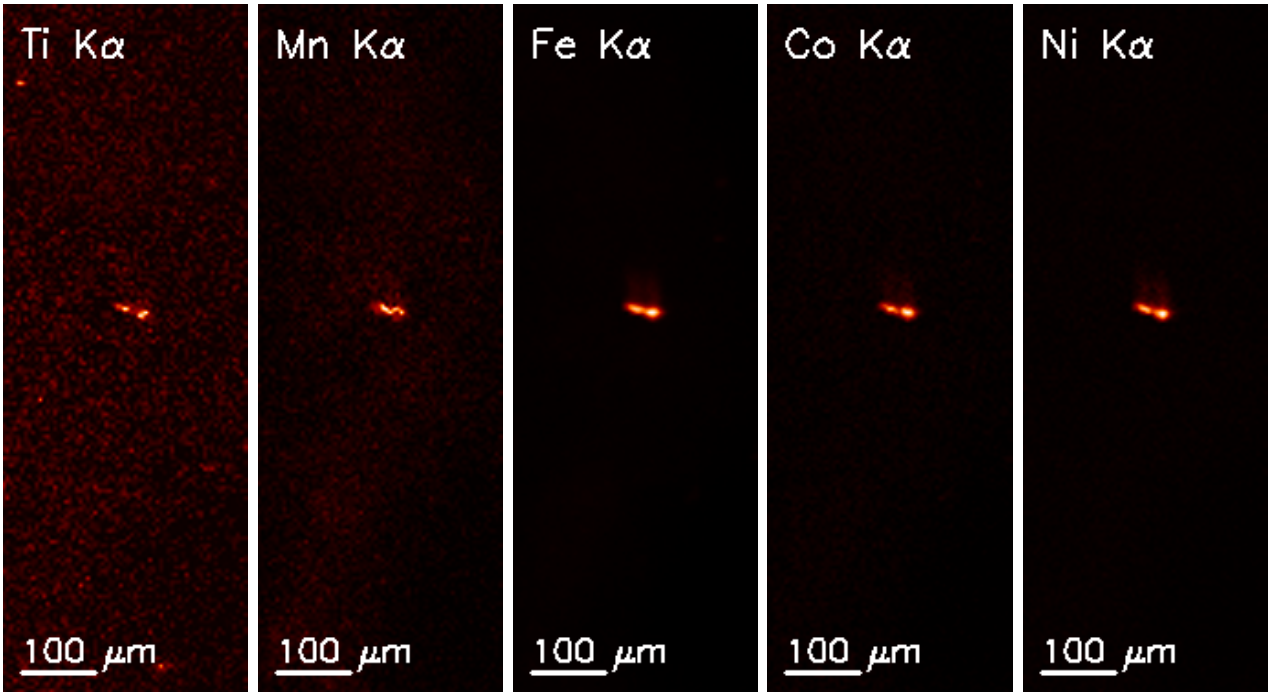

Figure 2: Elemental map showing high correlation between Ti, Mn, Fe, Co, and Ni. The particle was located in the lower right region of the sample (see Figure 1a).

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